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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,089	05/04/2001	Geert Arnout Awater	5-13	9414

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EXAMINER

FARKHONDAR, FARIMA

ART UNIT	PAPER NUMBER
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2681

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DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/849,089

Applicant(s)

GEERT AR4MOUT AWATER
UTRECHT

Examiner

Farima Farkhondar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8-9 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 8 and 9 is/are rejected.
- 7) ☒ Claim(s) 4, 6 and 7 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 6.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Raleigh et al, WO 98/09381.

Regarding claim 1, Raleigh discloses a wireless radiofrequency data communication system (abstract, lines 1-4) comprising: a base-station comprising multiple first sets and a signal processing-unit (page 18, lines 10-14) wherein each first set comprises a transmitter- and receiver-unit provided with a transmitter and a receiver and at least one antenna which is connected to the transmitter- and receiver-unit (Figure 7, element B, note B is the base station, wherein the signal processing-unit is connected with each of the first sets for processing signals received by the first sets and processing signals to be transmitted by the first sets (Figure 7), and multiple second sets (Figure 7, element S, note S is the subscriber's mobile, see also Figure 6A and 6B), wherein each second set comprises a transmitter- and receiver-unit provided with a transmitter and a receiver and at least one antenna which is connected to the transmitter- and receiver-unit (S in figure 6A, note it is inherent that a mobile

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station has transmitter and receiver connected to at least one antenna), characterised in that, the signal processing-unit comprises information about the transfer-functions of radiofrequency signals from each of the antennas of the first sets to each of the antennas of the second sets and/or vice versa, and wherein the transmitters and receivers, both in the first sets and in the second sets, operate on essentially the same radiofrequency or radiofrequency-band, (page 6, lines 14-31, and page 19, lines 6-28) wherein the signal processing-unit processes the signals received by the first sets and processes the signals to be transmitted by the first sets on the basis of said transfer functions such that for each second set of a plurality of the second sets an individual communication channel is formed with the base-station wherein these communication channels are generated simultaneously and separately from each other (Abstract, see also .page 12, lines 6-21)

Regarding claim 2, Raleigh further discloses the communication channels are duplex communication channels (page 10, 1-12, note "distinct downlink signals and distinct uplink signals" reads on "duplex communications channels", see also Figures 5A and 5B).

Regarding claim 3, Raleigh further discloses the number of first sets is N and, in use, the number of second sets is M , wherein N is greater than M , wherein the signal processing-unit is provided with an inputport for inputting M signals to be received by the respective M second sets, wherein the processing unit is

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arranged to process the M signals in combination on the basis of the information of the transfer-functions to obtain N transmit-signals which are fed to the respective N first sets for being transmitted by the first sets to the second sets and wherein the processing unit is arranged to process the M signals in combination in such a way that the M signals are received separately by the respective M second sets if the second sets each receive the N transmit signals, thereby establishing M of said simultaneous communication channels (page 10, lines 1-10, and claim 6).

Regarding claim 5, Raleigh further discloses the number of first sets is N and, in use, the number of second sets is M, wherein N is greater than M, wherein, in use, each of the M second sets transmits a signal so that M signals are transmitted to be received in combination by the first sets wherein the signal processing-unit is arranged to process in combination signals received by each of the first sets on the basis of the information about the transfer-functions to recover the M signals transmitted by the M second sets separately from each other, thereby obtaining M of said simultaneous communication channels (page 10, lines 1-10, and claim 6).

Allowable Subject Matter

3. Claims 4, 6-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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Regarding claim 4, the applicant claims a wireless radiofrequency data communication system according to claim 3, characterised in that, the processing unit is arranged to, in use, process, on the basis of the information about the transfer-functions H , the M signals Q to obtain the N transmit-signals R , to be transmitted by the first sets, according to $R = P \cdot D \cdot Q$, (A) resulting in that the M signals Q are received separately by the respective second sets if the second sets each receive the N transmit-signals, where $P \cdot D = [H^*(H^*H)]^{-1}$.^T is the pseudo inverse for HT and where H^* is the complex conjugated and transposed of H , wherein H is a complex $[N \times M]$ matrix containing transfer functions h_{ij} ($i=1, \dots, N; j=1, \dots, M$), wherein h_{ij} is the transfer function for transmission from the j th second set of the M second sets to the i th first set of the N first sets, and where Q is a complex M dimensional vector $[Q_1, Q_2, \dots, Q_M]$ ^T wherein Q_j is the signal to be transmitted to the j th second set of the M second sets and where $R = [R_1, R_2, \dots, R_i, \dots, R_N]$ ^T wherein R_i is the transmit-signal to be transmitted by the i th first set of the N first sets. No other reference has been discovered that would suggest modifying Raleigh, such that claim 7 would be obvious. Therefore the limitations as mentioned above of comprises a unique combination of subject matter that is neither taught nor suggested by the prior art.

Regarding claim 6, the applicant claims the processing unit is arranged to, in use,

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process, on the basis of the information about the transfer-functions H , the signals r which are received by the first sets, to calculate an estimation x_{est} of the M signals $x_{sup.c}$ which were transmitted by the M second sets, according to the mathematical expression $x_{sub.--est} = P_{sub}.U_r$, (B) where

$P_{sup}.U = [(H^*H)_{sup}^{-1}H^*]$ is the pseudo-inverse for H and where H^* is the complex conjugated and transposed of H , wherein H is a complex $[N \times M]$ matrix containing transfer functions $h_{sub.ij}$ ($i=1, \dots, N; j=1, \dots, M$), wherein $h_{sub.ij}$ is the transfer function for transmission from the $j_{sup.th}$ second set of the M second sets to the $i_{sup.th}$ first set of the N first sets, r is a complex N dimensional vector $[r_{sub.1}, \dots, r_{sub.i}, \dots, r_{sub.N}]_{sup.T}$ with $r_{sub.i}$ the signal received by the $i_{sup.th}$ first set of the N first sets, x_{est} is a complex M dimensional vector $[x_{est.sub.1}, \dots, x_{est.sub.M}]_{sup.T}$ where $x_{est.sub.j}$ is an estimation of $x_{sup.c.sub.j}$ and where $x_{sup.c}$ is a complex M -dimensional vector $[x_{sup.c.sub.1}, \dots, x_{sup.c.sub.j}, \dots, x_{sup.c.sub.M}]_{sup.T}$, with $x_{sup.c.sub.j}$ being the signal transmitted by the $j_{sup.th}$ second set of the M second sets. No other reference has been discovered that would suggest modifying Raleigh, such that claim 6 would be obvious. Therefore the limitations as mentioned above of claim 6 along with additional subject matter associated with the claim (claim 7) comprises a unique combination of subject matter that is neither taught nor suggested by the prior art.

4. Claims 8-9 are allowed.

Regarding claim 8, Raleigh discloses a wireless radiofrequency data communication system comprising in use: $k_{sub.1}$ multiple first groups, wherein each first group comprises a transmitter-unit and at least one antenna which is connected to the transmitter-unit for transmitting a signal (Figure 7, element B); and $k_{sub.2}$ multiple second groups, wherein each second group comprises a receiver-unit and at least one antenna which is connected to the receiver-unit (Figure 7, element S), characterised in that, the wireless radiofrequency data communication system further comprises a signal processing-unit (page 18, lines 10-14). Raleigh does not disclose the signal processing unit which is, if $k_{sub.1} > k_{sub.2}$, connected to each of, the first groups and which is, if $k_{sub.1} < k_{sub.2}$, connected to each of, the second groups, wherein the signal processing-unit comprises information about the transfer-functions of radiofrequency signals from each of the first groups to each of the second groups and/or vice versa, and wherein, each of the transmitter-units, of the first groups operates on essentially the same radiofrequency or radiofrequency band, and wherein, in use, if $k_{sub.1} > k_{sub.2}$, the signal processing-unit processes $k_{sub.2}$ data-signals to be transmitted to the $k_{sub.2}$ second groups for obtaining $k_{sub.1}$ signals which are supplied to the respective first groups to be transmitted, wherein the $k_{sub.2}$ data signals are processed on the basis of said transfer functions in such a manner that the respective second groups will receive separately the respective $k_{sub.2}$ data-signals, thereby establishing $k_{sub.2}$ simultaneous communication channels, and wherein, in use, if $k_{sub.1} < k_{sub.2}$,

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the signal processing-unit processes $k_{sub.2}$ signals, which are received by the respective second groups on the basis of said transfer functions in such way that an estimation is made of the $k_{sub.1}$ signals transmitted by the first groups, thereby establishing $k_{sub.1}$ simultaneous communication channels.

Furthermore, no other reference has been discovered that would suggest modifying Raleigh, such that claim 8 would be obvious. Therefore the limitations as mentioned above, along with additional subject matter associated with the claim (claim 9) comprises a unique combination of subject matter that is neither taught nor suggested by the prior art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US patent 5592490, Barratt et al., Spectrally Efficient High Capacity Wireless communication Systems. A signal processor at each base station connected to the receiving antenna elements and to the transmitting antenna elements for determining spatial signatures and multiplexing and demultiplexing functions for each remote terminal antenna for each conventional channel.

US Patent 5642353, Roy, III et al., Spatial Division Multiple Access Wireless Communication Systems. A method for calculating a n appropriate spatial multiplexing strategy for simultaneous transmission of signals to users in the

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same channel. This can be the same as or distinct from the aforementioned receive channel.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Farima Farkhondar whose telephone number is 703-305-6285. The examiner can normally be reached on 9:00 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nguyen Vo can be reached on 703-308-6728. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Farima Farkhondar-Tonsey
Examiner
March 18, 2004

Nguyen Vo
3-18-2004

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PRIMARY EXAMINER